TEACHER EVENT CHECKLIST
SPACE FOOD EXPEDITION (ASTRONAUT FOOD)

Date Completed	PRE EVENT REQUIREMENTS
	1. Print out a copy of this entire file (color copy preferred). Please note: this document is 24 pages long.
	2. Sign Agreement to Participate on page 2 and Fax or E-mail to Distance Learning Outpost within 3 business days of confirmation.
	3. Have students take Pre-Event Quiz on page 6.
	4. Complete all pre-event activities on pages 9 to 19 with the students.
	5. Teacher to E-mail a minimum of 5 student questions to our office no later than 3 business days prior to your event.
	6. Review NASA Event Guidelines on page 20 with students.
	DAY OF EVENT ACTIVITIES
	1. The students will be asked to share the results from their pre-work activities with the NASA DLO presenter.
	POST EVENT REQUIREMENTS
	1. Have students take Post-Event Quiz on page 6 for evaluation and assessment.
	2. Teacher(s) and students to fill out event feedback.
	2. Distance Learning Outpost will respond to any follow-up questions via e-mail.
	3. Students to complete extended activities on page 21 at Teacher's discretion.

Teacher Agreement To Participate

NASA's Distance Learning Outpost

I have reviewed the Space Food Learning Module and agree to complete all of the required activities with my students, both prior to, and following, the video teleconferencing event.

Teacher(s) ______________________________

School/Institution ______________________________

Event # ______________________________

Date of Event ______________________________

Fax this form to the Distance Learning Outpost Office at (281) 483-3789

or

E-mail to dlo1@jsc.nasa.gov within 3 business days of confirmation.

Instructional Goal

Upon completion of this learning module, students will be able to explain which variables are included in a person's daily dietary requirements. They will also be able to discuss space food in detail, including its purpose and how it is created, prepared and disposed.

Learning Objectives

1. Students will be able to explain the purpose of space food.
2. Students will be able to describe how space food is created, prepared, and disposed.
3. Students will be able to accurately calculate different individual's daily dietary requirements.

National Education Standards

Science Standards (NSTA)

Science as Inquiry
Abilities necessary to do science inquiry

Science in Personal and Social Perspectives
Personal Health

Mathematics Standards (NCTM)

Compute fluently and make reasonable estimates

- develop fluency in adding, subtracting, multiplying, and dividing whole numbers

STUDENTS WILL PRESENT THEIR ACTIVITY RESULTS DURING THE VIDEO TELECONFERENCE WITH NASA.

Grade Level:

Grades 5-8

Estimated Time Requirements:

1. Preparation Time
   a. Time necessary to download & print the lesson from the computer
   b. Time necessary to become familiar with the lesson
2. Execution Time by Activity
   a. Activity Set #1 30 minutes
   b. Activity Set #2 (choose two)
      i. Activity A 50 minutes
      ii. Activity B 50 minutes
      iii. Activity C 50 minutes
   c. Activity Set #3 25 minutes
   d. Video Teleconference 50 minutes

Texas Essential Knowledge and Skills (TEKS)

Science	Health
5.2 B,D	6.1 A, B
6.2 C,D	7.1 A, B
7.2 C,D	7.4 C
8.2 C,D	8.1

Math

5.3	7.2B
6.2	8.2B

INSTRUCTIONAL STRATEGY

Pre-Event Classroom Component

Activity Set #1

1. Students take Pre-Event Quiz on page 6 to test their knowledge prior to these lessons about space food. Students keep these quizzes on file to compare to their Post-Event Quiz for evaluation and assessment.

2. Students should become familiar with the terminology on page 8 that will be used in the activities and during the event with NASA. It is up to the teacher's discretion on how and when to introduce the terms.

Activity Set #2

Please select at least two, ideally all three, of the activities below (A-C) to complete with your class.

1. Activity A on page 10

   In this activity, students learn to calculate several individual's basal metabolic rate and daily dietary requirement. Using their calculated results and the caloric intake for each person, the students will determine if the person is eating healthy and will make suggestions how the person can improve their eating habits.
   Students will be asked to discuss the variables that make up a person's daily dietary requirement and how each person could improve their eating habits during the video teleconference.

1. Activity B on page 14

   In this activity, students experience firsthand what it is like to lose a portion of their sense of smell and how sight can impact the taste of the food. This is important because when an astronaut is in space, their sense of smell is reduced and if they don't find the food visually appealing, they often loose their appetite. Food scientists know this and take both problems into consideration when creating space food.
   Students will be asked to discuss their Senses and Flavor Experiment results during the video teleconference.

3. Activity C on page 18

   In this activity, students become familiar with the different procedures used in the food lab at NASA to prepare space food. They perform an experiment dealing with rehydration, the most common method of preparing space food.
   Students will be asked to discuss their *Rehydration Experiment* results during the video teleconference.

Activity Set #3

1. Student Questions
   - Develop at least 5 questions from the class on space food
   - These questions should go beyond the basic information within the program
   - E-mail your questions at least 3 business days prior to your event with NASA
   - E-mail address is: DLO1@jsc.NASA.gov

2. Prepare students for their participation in a live, interactive video teleconference with NASA's Distance Learning Outpost using the guide on page 20.

Pre/Post Quiz
Space Food Expedition

1. What is the purpose of space food?

2. What are the differences between space food and Earth food?

3. Name and describe as many ways as you can think of to create space food.

4. While in space, how do astronauts prepare their food?

5. While in space, how do astronauts dispose of the food's packaging?

6. What factors are included in a person's daily dietary requirements?

Pre/Post Quiz
Space Food Expedition

TEACHER ANSWER KEY – Please don't share with the students. Answers should be similar to:

1. *What is the purpose of space food and what must be considered when making it?*

   Since an astronaut cannot just run to the store or vending machine when they are hungry, NASA must send food up with them. They need food especially made for travel and consumption in space. Some of the things they must consider are:

   - Shelf life- because they need food that is safe and lasts a long time
   - Taste- because being in space affects your sense of taste and appetite
   - Nutrition- because astronauts need to eat healthy foods to get energy
   - Microgravity- because without much gravity, food can float everywhere and make a mess. That is why astronauts drink from straws and don't have foods that make a lot of crumbs.
   - Weight- because a shuttle can only hold a certain amount of weight
   - Waste- because they only have so much room for garbage, they use pouches that are flat and lightweight.

2. *What are the differences between space food and Earth food?*

   NASA tries to make the foods that astronauts have in their homes on Earth. They just modify them so that they can go to space. In some cases, the food they take is the same as we buy at the store only packaged in lightweight, vacuum-sealed bags with Velcro. Other foods are pre-cooked and packaged in special pouches. Some foods and all of their drinks are dehydrated.

   One major difference is that all of the foods are ready to eat. All the astronauts have to do is heat them up or just add water.

3. *Name and describe as many ways as you can think of to create space food.*

   - Natural form- ready to eat foods packaged in clear, flexible pouches that are cut open with scissors, and require no further preparation for consumption in flight. Examples include candy, nuts, granola bars and cookies.
   - Thermostabilized-foods cooked in their containers (retort pouches, cans, or cups) to destroy harmful microorganisms and enzymes.
   - Rehydratable- food that has the water removed from it on Earth. While in space, the astronauts add water so that the food returns to its original form.
   - Irradiated- process where food is exposed to radiation to kill harmful bacteria and other microscopic creatures that cause food to spoil and illness in people. Irradiation uses waves of radiation much like an x-ray or a microwave oven and is done while on Earth.

4. *While in space, how do astronauts prepare their food?*

   Astronauts have a specially made tray that is equipped with Velcro patches to keep the food pouches in place and magnets to keep the silverware in place. The silverware includes a fork, spoon and a pair of scissors. For natural form foods, the astronauts simply cut open the bag and eat it. Astronauts also cut open the retort pouches holding the thermostabilized and irradiated foods in them and warm them in an electric oven. Rehydratable food and beverages are packaged in pouches that have a special septum built in to them. The astronauts use the galley, which has a special machine that plugs into the septum of the rehydratable packages, to pump water into these bags. They drink the beverages through straws.

5. *While in space, how do astronauts dispose of the food's packaging?*

   The food packaging used in space comes back to Earth with the astronauts. The astronauts designate a special area where they keep all of the used packages and stack them very carefully so they have enough space for everything. They have a bag for wet trash and one for dry trash. That is why the flexible pouches are so important.

6. *What factors are included in a person's daily dietary requirements?*

   When considering one's daily dietary requirement it is important to think of the types of food (dairy, fruits and vegetables, meats, etc.) and the number of calories consumed. A person should govern their proportions of different types of food they eat using the Daily Food Guide (see Activity A)

   To figure out how many calories an individual needs to operate, one considers primarily the activity level and uses the basal metabolic rate (BMR) equation. The BMR result varies from person to person because it depends greatly on the individual's gender, size, and age. The goal is to eat as many calories as is required to perform the individual's daily activities.

Space Food Terminology

The following is a list of words and definitions that your students need to be familiar with because the words are used throughout the activities and video teleconference. They will be asked to explain the meaning of these terms **in their own words** during the video teleconference.

1. Nutrients — needed to promote growth and health
2. Daily Dietary Requirements — the average daily dietary intake level that is sufficient to meet the person's nutrient requirement
3. Basil Metabolic Rate (BMR) — minimal caloric requirement needed to sustain life in a resting individual
4. Space Food — food that is eaten in space
5. Sensory Evaluation — systematic rating of how a food looks, smells, feels, and tastes performed by NASA scientists and astronauts
6. Rehydration — process to restore fluid to an item
7. Irradiation — process where the food is exposed to radiation
8. Thermostabilization — process where foods are heated to destroy harmful microorganisms and enzymes
9. Natural — unchanged

Background Articles to Help You Become Familiar with Space Food

A Matter of Taste	http://nasaexplores.com/search_nav_5_8.php?id=03-038&gl=58
Eat Right for Long-Distance Flight	http://nasaexplores.com/search_nav_5_8.php?id=02-042&gl=58

Activity A
Space Food Expedition

CALCULATING DAILY DIETARY REQUIREMENTS

<u>Materials</u>

- *Daily Dietary Requirement Exercise* handout (one per student, pages 11-12)
- Calculator
- Paper
- Pencil

<u>Background</u>

Every human has a daily dietary requirement in order to perform activities such as playing sports, eating, and even breathing! A person's daily dietary requirement is basically the amount of energy required for the body to function for 24 hours. Humans get their energy in the form of calories by consuming food and beverages. A calorie is simply a measurement of energy. When considering one's daily dietary requirement it is important to think of the types of food (dairy, fruits and vegetables, meats, ect.) and the number of calories consumed.

To figure out how many calories an individual needs to operate, one considers primarily the activity level and uses the basal metabolic rate (BMR) equation. The BMR result varies from person to person because it depends greatly on the individual's gender, size, and age. *The goal is to eat as many calories as is required to perform the individual's daily activities.* Each item a person ingests has a certain number of calories related to it. By using a person's BMR, the types of food and beverages consumed, and comparing them to the total calories ingested, a conclusion may be formed on whether the person is eating healthy or not. If a person ate more calories than they used, then they will likely gain weight. If they ate fewer calories than they used, then they will probably lose weight. As long as the number of calories consumed is close to the number of calories used, it can be concluded that the person is eating healthy.

The procedure for calculating dietary requirements is not only for humans on Earth, but also for humans in space! One item that NASA's nutritional specialists are responsible for is calculating each astronaut's daily dietary requirement. The astronauts get to look over, sample, and request the space food they would like for their mission. Then the nutritional specialists create a daily menu for each of the astronauts using their dietary requirements and space food requests.

In this activity, your students become familiar with daily dietary requirements, analyze the three people's BMR, activity level, and intake below. Their task is to determine if the person is eating healthy or not. The students will need to defend their stance and suggest any changes in the person's diet that they believe would make them healthier.

<u>Procedure</u>

1. Read background information above to the class.

2. Introduce what daily dietary requirement means and which factors go into calculating it.

3. Inform the students what BMR stands for and how to calculate it.

4. Pass out the *Daily Dietary Requirement Exercise* handout.

5. As a class, calculate Abby McGregor's daily dietary requirement.

6. Have the students work individually to complete the *Daily Dietary Requirement Exercise* Ben Ellington and David Porter's daily dietary requirements.

<u>Student Presentation</u>

Students will be asked to discuss the variables that make up a person's daily dietary requirement during the video teleconference.

Daily Dietary Requirement Exercise Handout

Name: ____________________________________ Class: _______ Date: _______

Directions: Follow the procedure below to calculate three different people's daily dietary requirement. As a class, calculate Abby McGregor's daily dietary requirement. Working individually, calculate Ben Ellington and Hayden Porter's daily dietary requirement.

1. Calculate *each* person's basal metabolic rate (BMR) below on a separate sheet of paper. To do this, you will need to select the appropriate BMR equation below (male if the person is male, female if the person is female). Then simply insert the correct values for the matching variable.

Abby McGregor		Ben Ellington		David Porter	
Weight: 130 pounds Height: 68 inches Age: 32 Activity Level: Light		Weight: 225 pounds Height: 74 inches Age: 18 Activity Level: Heavy		Weight: 165 pounds Height: 71 inches Age: 24 Activity Level: Medium	
Food Consumed		Food Consumed		Food Consumed	
	Cal		Cal		Cal
Oatmeal with Raisins	135	Scrambled Eggs	224	2 Granola Bars	248
Apple	81	Fruit Drink	130	Pineapple	79
Peanuts	455	Oatmeal + Brown Sugar	99	Almonds	426
Macaroni with Cheese	404	Granola with Blueberries	244	2 Rolls	232
Ham	125	Trail Mix	730	Tuna Salad	202
Chocolate Pudding	183	Frankfurter	104	Candy Coated Chocolates	33
Beef Stroganoff	178	Vanilla Pudding	154	Lemonade	105
Dried Apricots	54	Turkey Tetrazzini	710	Chicken Pie with Vegetables	496
2 Milk (2%)	258	Milk (2%)	258	3 Milk (2%)	387

Female Basal Metabolic Rate (BMR):

$$655 + (9.6 \times (\text{weight(lb)}/2.2)) + (1.8 \times (\text{height(in)}/2.54) - (4.7 \times \text{age(yrs)}))$$

Male Basal Metabolic Rate (BMR):

$$66 + (13.7 \times (\text{weight(lb)}/2.2) + (5 \times (\text{height(in)}/2.54) - (6.8 \times \text{age(yrs)}))$$

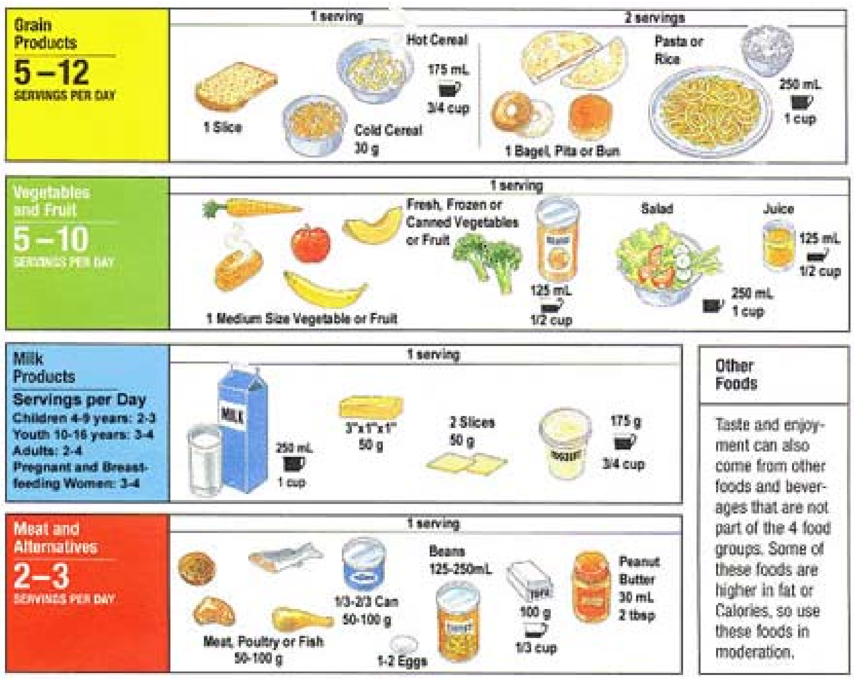
2. Using the Activity Level Chart on the next page, calculate each person's daily dietary requirement. Be sure to show your work and circle your final answers. For example, if Billy's activity level is "medium", you would use the Medium Activity Level equation (BMR x 1.70) to calculate his daily dietary requirement.

Activity Level:

Sedentary	Light	Medium	Heavy
BMR x 1.45	BMR x 1.60	BMR x 1.70	BMR x 1.88

3. Using the Daily Food Guide below, make sure that the individual is eating the right types of food. Take notes on what you observe. For instance, if you notice that Abby is only eating candy, write that down and make note of what is missing from her diet (fruits, grains, milk, ect.).

DAILY FOOD GUIDE



4. Determine the individual's caloric intake, by adding the listed calories next to each food item consumed (found in chart on page one). The caloric intake is simply the total number of calories consumed by each person. Be sure to show your work and circle your final answers.

5. Compare the person's daily dietary requirement to the number of calories they consumed. Keeping in mind the Daily Food Guide, write a short paragraph concluding whether the person is eating healthy or not and why.

Activity B
Space Food Expedition

THE SENSES AND FLAVOR

Materials

- 3 different flavors of gelatin
- Small Plastic or Paper plates and napkins (3 per student)
- Dark food coloring
- Bandanas or blindfolds for at least half of the class
- *Senses and Flavor Experiment* handout (one per student, pages 15-16)

Background

It is essential that astronauts consume food for the energy required to perform the tasks of a mission. To ensure that the astronauts eat properly, NASA works hard to prepare food that tastes good so they do not lose their appetite and stop eating. Plus, great-tasting food makes life in space more enjoyable.

The five human senses (taste, touch, sight, smell, and hearing) work together to tell the brain about our environment. For example, anyone who has had a stuffy nose knows that when you can't smell your food it does not taste the same. Sight and smell influence what you can taste.

In space, the astronauts actually lose some of their sense of taste. Although scientists are not exactly sure why this occurs, some have created hypothesis to explain this phenomenon.

There are a couple reasons astronauts cannot smell their food as they would on Earth. First, exposure to space causes fluid to move to the head resulting in a "stuffy" sensation in the nose. The reason for the movement of this fluid is due to the extreme reduction in gravity. In addition, the lack of gravity affects the aroma of a food. On Earth, the aroma of a meal rises with heat to greet your nose. Without gravity, the aroma of a meal scatters in all directions. Besides, an astronaut may prefer to eat upside down. Finally, because astronauts eat out of thermostabilized and rehydratable pouches and containers, the smell does not escape from the food as easily as from a plate of food.

Astronauts cannot see their food as well as they would on Earth. The color affects the way that food looks. In addition, while someone on Earth can see a whole plate full of their favorite meal, an astronaut eating out of a pouch cannot see their delicious food.

Before NASA sends any food into space with the astronauts, they perform **sensory evaluations** of the foods. Astronauts and other NASA personnel judge a potential space food based on how it looks, smells, tastes, and feels (texture). Only the "good" foods are kept. The ones that people do not like are removed or the recipe is changed.

Procedure

1. *On the night before the experiment*

   Make three batches of finger gelatin (please refer to gelatin package for directions). For two of the pans, add food coloring so that the gelatin matches the color of the third. For example, if using grape, cherry, and lemon, add drops of purple food coloring so that all of the gelatin samples look like the grape flavor. Keep track of what the real flavor is for the three different samples

In class:

2. Read background information above to the class.
3. Tell the students that today they will see how smell and sight influence taste.
4. Divide the class into three groups. One group will wear blindfolds, one group will pinch their noses, and one group will do both during the experiment.
5. Instruct the class that they are not to talk or give classmates hints.
6. Pass out the blindfolds to the appropriate groups and *Senses and Flavor Experiment* handout to the entire class.
7. Instruct students to put on their blindfolds, pinch their noses, or both. When they have done this, give them a square of gelatin (Sample #1) and have them taste it.
8. When they have eaten the sample, have them remove the blindfold if they are wearing one, clean their hands with the napkin, and answer the questions on *Senses and Flavor Experiment* handout about Sample 1. Remind the class that they are not to discuss their answers until the end.
9. Repeat steps 7-8 for Sample 2 and Sample 3.
10. Once completed, have the class share their results and total their answers.
11. Discuss how their sight and smell "tricked" their sense of taste.

<u>Student Presentation</u>
Students will be asked to discuss their *Senses and Flavor Experiment* results during the video teleconference.

Senses and Flavor Experiment Handout

Name: ______________________________________ Class: _______ Date: _______

Directions: Today you are a food specialist conducting a sensory evaluation for a new gelatin recipe for the astronauts. Your teacher will tell you if you need to wear a blindfold, pinch your nose so you cannot smell, or both. When you are ready, your teacher will give you a sample of gelatin and you can taste it. The teacher will tell you to clean your hands and remove the blindfold (if you are wearing one) so you can answer the following questions.

Sample 1:

1. What FLAVOR did Sample 1 taste like? _________________________________
2. What COLOR did Sample 1 taste like? __________________________________
3. How much did you like Sample 1? *(please place an X in the box)*
   - [ ] It was awful
   - [ ] It was not very good
   - [ ] It was not bad or good
   - [ ] It was pretty good
   - [ ] It was excellent
4. Do you think astronauts should bring Sample 1 with them into space? _________________

When finished, prepare for the next sample (put on blindfold, pinch your nose, or both).

Sample 2:

1. What FLAVOR did Sample 2 taste like? ________________________________
2. What COLOR did Sample 2 taste like? __________________________________
3. How much did you like Sample 2? *(please place an X in the box)*
   - [ ] It was awful
   - [ ] It was not very good
   - [ ] It was not bad or good
   - [ ] It was pretty good
   - [ ] It was excellent
4. Do you think astronauts should bring Sample 2 with them into space? _________________

When finished, prepare for the next sample (put on blindfold, pinch your nose, or both).

Sample 3:

1. What FLAVOR did Sample 3 taste like? _________________________________
2. What COLOR did Sample 3 taste like? __________________________________

3. How much did you like Sample 3? *(please place an X in the box)*
   [ ] It was awful
   [ ] It was not very good
   [ ] It was not bad or good
   [ ] It was pretty good
   [ ] It was excellent

4. Do you think astronauts should bring Sample 3 with them into space? _________________

Part B.
<u>What did the class think?</u>

1. What FLAVOR(S) did the class think Sample 1 tasted like?

____

____

2. What FLAVOR(S) did the class think Sample 2 tasted like?

____

____

3. What FLAVOR(S) did the class think Sample 3 tasted like?

____

____

4. How much did the class like:

   Sample 1____

   Sample 2____

   Sample 3____

5. Which sample(s) did the class think the astronauts should bring into space? ___________________

Activity C
Space Food Expedition

REHYDRATION

Materials

- At Least 3 Assorted Dehydrated Foods (one piece of each different dehydrated food per group)
  - Noodles, Meats, and Fruits should work well.
- Small Plastic Bowls (one per group)
- Scale (one per group)
- Warm Water
- Beaker (one per group)
- *Rehydration Experiment* handout (one per student, page 19)

Background

There are four types of space foods that make it on to the space orbiter. The types include rehydratable, thermostabilized, irradiated, and natural form items.

The **rehydratable** food package is made from flexible material to aid in trash compression. It consists of a flexible bowl and lid with a septum adapter for adding water from the galley. Velcro on the bottom of the package holds it on the meal tray. After adding the required amount of water to the package, it is placed in the oven if the food is to be served hot or directly onto the serving tray if the food is to be served cold. The top of the package is cut off with a knife or scissors, and the contents are eaten with a fork, spoon, or fingers.

Thermostabilized foods are heat processed to destroy harmful microorganisms and enzymes. Individual servings of thermostabilized foods are commercially available in aluminum or bimetallic cans (your standard tuna can or fruit can), plastic cups, or flexible retort pouches. The retort pouch is metallic and is very similar to the metal cans. The main differences are that they are lighter in weight, easier to store, and take up less room in the trash.

Most of the fruits and fish such as tuna and salmon are thermostabilized in cans. The cans open with easy-open, full-panel, pullout lids. Puddings are packaged in plastic cups. Most of the entrees are packaged in flexible retort pouches. This includes products such as beef tips with mushrooms, tomatoes and eggplant, chicken à la king, and ham. After the pouches are heated, they are cut open with scissors. The food is eaten directly from the containers with conventional eating utensils.

Some **irradiated** meat items are also available for Space Shuttle and International Space Station crews. This is a process where food is exposed to radiation to kill harmful bacteria and other microorganisms that cause food to spoil and illness in people. Irradiation uses waves of radiation much like an x-ray or a microwave oven.

These products are very similar to thermostabilized foods in that they are ready to eat and only require warming prior to consumption. These items are packaged in flexible pouches.

Foods such as nuts, granola bars and cookies are classified as **natural form** foods. They are ready to eat, are packaged in clear, flexible pouches that are cut open with scissors, and require no further preparation for consumption in flight.

In this activity, students will get first hand experience with the differences between rehydratable items and natural form items.

Procedure

1. Introduce the four types of space foods and describe each type (refer to background info above).

7. Tell the students that today they will learn, in detail, about rehydration.

8. Break the students into teams of 2-4 depending on the number of supplies you have available. The smaller the group, the better.

9. Pass out the *Rehydration Experiment* handout.
10. Allow the students to perform the experiment and answer the questions on the handout.

Student Presentation

Students will be asked to discuss their *Rehydration Experiment* results during the video teleconference.

Rehydration Experiment Handout

Name: ______________________________________ Class: _______ Date: _______

Materials:

- Several Dehydrated Foods
- Small Plastic Bowl
- Scale
- Warm Water
- Beaker

Procedure:

Keep track of your data on paper in the form of a chart. Be sure to show all of your calculations too.

1. Weigh a bowl.
2. Weigh a dehydrated food while it is placed in the bowl.
3. Place in a container of warm water.
4. Allow the food to completely rehydrate (until it won't absorb anymore water).
5. Remove the food from the container and blot dry.
6. Weigh the rehydrated food while it is placed in the bowl.
7. Calculate the percentage of rehydration. Use the formula below:

$$\% \text{ Rehydration} = ((\text{gain in mass} + \text{original mass})/\text{original mass}) \times 100$$

8. Using the same bowl, repeat steps 2 – 7 for each dehydrated food.

Questions:

1. Which food item gained the most weight?

2. Do you think that the food weighs the same amount as it did before it was dehydrated? Explain.

NASA Event Guidelines

Review the following points with your students prior to the video teleconference event:

1. A video teleconference is a two-way event. Students and NASA presenters can see and hear one another.
2. Students are representing their school; they should be on their best behavior.
3. Students should be prepared to give brief presentations, ask questions and respond to the NASA presenters.
4. A Teacher(s) or other site facilitator should moderate students' questions and answers.
5. Students should speak into the microphone in a loud, clear voice.

Get Ready, Be Ready, and have fun with your Distance Learning Event with NASA!

Post Event Teacher – Student Evaluation

1. **We need your help and support!** Choose the appropriate Form below. It usually takes teachers and students **less than 10 minutes** to complete. We welcome any input that you have at the following sites:
    1. Teacher Feedback Form:
       https://ehb2.gsfc.nasa.gov/edcats/centers/distance_learning.html
    2. Student K-4 Feedback Form:
       TBD
    3. Student 5-8 Feedback Form:
       TBD
    4. Student 9-12 Feedback Form:
       TBD
    5. Technical Contact Feedback Form:
       https://ehb2.gsfc.nasa.gov/edcats/centers/jsc_dlo_tech_contact.html
    6. Parent/Chaperone Feedback Form:
       https://ehb2.gsfc.nasa.gov/edcats/centers/distance_learning_parent.html

2. Students and Teachers are **welcome to e-mail the Distance Learning Outpost** with any follow-up questions from the event at: DLO1@jsc.NASA.gov

3. **Please send** us any photos, video, school web page link, newspapers articles, etc. of your event. We will be glad to post them on our web page!

Extended Activities for Space Food

1. Perform further research on the Internet at

   http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/Space.Food.and.Nutrition/Space.Food.and.Nutrition.pdf

   or

   http://www.nasa.gov/

2. Activity Set #4 on page 22

   In this activity, students will think of different ways to reduce the size and weight of several, everyday items from the grocery store.

Activity #4
Space Food Expedition

WHY SPACE FOODS?

Materials

- *How Low Can You Go?* directions and chart (one per student, pages 24-25)
- Scale
- Ruler (one…needs to measure in cm)
- Fresh Banana in Peel (one)
- Regular Package of M&M's (one)
- Flavored Sports Drink in Bottle (one)
- Chicken Leg with Bone in Plastic Bag (one)
- Packaged Loaf of Bread (one)

Background

Pretty much everyone has heard of space food, but why do we need it? Why can't we just run to the grocery store before a launch to stock up on food? It turns out that on the orbiter there is limited space and weight available. For this reason, NASA's food specialists must try to reduce the size and weight of the food that will go into space, while keeping it as *normal* as possible.

In this activity, students will become familiar with the purpose of space food. The students will also think of different ways to reduce the size and weight of several, everyday items from the grocery store.

Procedure

1. Ask the students, "Everyone has probably heard of space food, but why do we need it?" Write the student's suggestions on the overhead/board. (Allow up to 5 minutes)

2. If limited space and weight were not suggested, either use guidance to get it suggested or point out this pattern (that is likely there) in the list.

3. Tell the students that NASA cares so much about reducing the size and weight of food for space flight that they hire several food specialists to work on it as their job.

4. Announce to the class that today they are food specialists and their job is to think of ways to reduce the size and weight of many, everyday food items.

5. Pass out the *How Low Can You Go?* directions and chart.

6. Read the directions to the class.

7. Complete the *How Low Can You Go?* chart by following the given directions. (Allow the remainder of class)

How Low Can You Go? Directions

Name: ______________________________________ Class: _______ Date: _______

Directions: Today you are a food specialist responsible for shrinking the size and weight of several, everyday food items that can often be found at your grocery store. Use the chart on the next page to help keep your data organized. Your teacher will present several items to the entire class, one at a time, 5 minutes for each one. For each item your teacher shows, follow these steps:

1. Write the name of the object in the first column.

2. Write a detailed description of the object in the second column. For example, if the teacher displays a can of pineapple chunks you would write that the object includes a paper label, metal can, pineapple juice, and pineapple chunks.

3. In the third column, write the weight (in ounces) of the object. Your teacher will select a student to look at the label for the object's weight or to weigh it on the scale and to announce the results to the class. If it is canned pineapple, the net weight could be 20 oz.

4. Write the size (in centimeters) of the object in the fourth column. Your teacher will select a student to measure the length, width, and height of the object with a ruler and to announce the results. The pineapple can is 8.5 cm x 8.5 cm x 11.5 cm.

5. Brainstorm and write down ways you would reduce the size and weight of the object. One way to do this with the canned pineapple is to drain the pineapple and place it in an airtight, plastic bag rather than a metal can.

(4/14/98) --- President Bill Clinton prepares to use a spoon to sample some space food while visiting the Johnson Space Center (JSC). Holding the food packet is U.S. Sen. John H. Glenn Jr. (D.-Ohio), currently in training at JSC as a payload specialist for a flight scheduled later this year aboard the Space Shuttle Discovery. Looking on is astronaut Curtis L. Brown Jr., STS-95 mission commander. The picture was taken in the full fuselage trainer (FFT). Photo Credit: Joe McNally, National Geographic, for NASA

How Low Can You Go? Chart

Item	Description	Weight (oz)	Size (cm)	Ways to Reduce It